

### Office Action Summary

**Application No.**

10/565,956

**Applicant(s)**

MURAKAMI ET AL.

**Examiner**

RAMY RAMADAN

**Art Unit**

2838

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 12 September 2008.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1, 2, 10-13, 21 and 22 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1, 10-12, 21 and 22 is/are rejected.
- 7) ☒ Claim(s) 2 and 13 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SB/888)  
Paper No(s)/Mail Date \_\_\_\_\_
- 4) ☒ Interview Summary (PTO-413)  
Paper No(s)/Mail Date \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: \_\_\_\_\_

**DETAILED ACTION**

**Amendments**

1. Acknowledgement is made of the amendment filed September 12, 2008.

***Response to Arguments***

2. Applicant's arguments with respect to claims 1, 10, 11, 12, 21 and 22 have been considered but are moot in view of the new ground(s) of rejection.

***Claim Rejections - 35 USC § 103***

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. **Claims 1, 11-12 and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tsuji et al. (US 6,160,380), hereinafter Tsuji, in view of Kikuchi (US 2004/0239333).**

As per claims 1 and 11, Tsuji discloses and shows in Figs. 1, 15 and 16, a method of estimating a residual capacity of a battery comprising:

a step of measuring a pair of data consisting of a current (I) and a terminal voltage (V) for a secondary battery (100), thus obtaining a plurality of pairs of data (Col. 6, lines 43-50 and Col. 13, lines 5-31);

a step of when the discharge current (I) is equal to zero (specific selection conditions are satisfied) determining a first open circuit voltage (Eo) (no load voltage) of

the battery (100) as a voltage intercept at a current zero (Col. 13, lines 17-31 and Figs. 15-17);

a step of, when the discharge current ( $I$ ) is not equal to zero for a certain amount of time (specific selection conditions are not satisfied and a specific current condition met for a certain amount of time), determining a second open circuit voltage ( $E_1$ ) from the terminal voltage ( $V$ ) of the secondary battery (Col. 13, lines 17-67, Col. 14, lines 1—36 and Figs. 15-17);

a step of determining a change in the open circuit voltage ( $E$ ) over a predetermined period of time and determining a battery capacity and a discharged electric amount ( $C(Ah)$ ) (estimated charge/discharge amount) based on the change in the open circuit voltage (Col. 13, lines 63-67 and Col. 14, lines 1-36 and lines 64-67);

a step of determining the residual energy (state of charge) of the battery (100) based on the battery capacity and discharged electric amount ( $C(Ah)$ ).

Although Tsuji discloses a determining an open circuit voltage using a straight line approximation when the current is zero (Fig. 15), he does not explicitly disclose obtaining the result using statistical processing.

However, Kikuchi discloses and shows in Fig. 7, an apparatus and method for judging a state of assembled battery wherein an electromotive force (OCV) is calculated as a voltage intercept in a straight line approximation obtained by a least squares method (statistical processing) with respect to a plurality of voltage and current data (Para [0039] and [0049]).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention was made to modify the method as disclosed by Tsuji to use a least squares method to determine the open circuit voltage as taught by Kikuchi to perform an accurate judgment of the open circuit voltage and state of charge of a battery (Para [0004]).

As per claims 12 and 22, the apparatus merely discloses the elements used to perform the steps of the method as disclosed above and since each step must be present to for the functionality of the elements, the apparatus as claimed would be obvious in view of the method as disclosed by Tsuji, in view of Kikuchi.

**5. Claims 10 and 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tsuji, in view of Kikuchi, further in view of Applicant Admitted Prior Art (APA).**

As per claim 10, Tsuji when modified by Kikuchi discloses the claimed invention except for recalculating a polarization voltage of the secondary battery based on the estimated charge/discharge electricity amount.

However, APA discloses a conventional method for determining a polarization voltage of a secondary battery based on the charge/discharge electricity amount (Applicant's disclosure, pages 1-2).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention was made to modify the method as disclosed by Tsuji when modified by Kikuchi to determine a polarization voltage of a secondary battery based on the

charge/discharge electricity amount to eliminate the effect of polarization voltage and therefore provide accuracy in measurements (Applicant's disclosure, pages 1-2).

As per claim 21, the apparatus merely discloses the elements used to perform the steps of the method as disclosed above and since each step must be present to for the functionality of the elements, the apparatus as claimed would be obvious in view of the method as disclosed by Tsuji when modified by Kikuchi.

***Allowable Subject Matter***

6. Claims 2 and 13 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

7. The following is a statement of reasons for the indication of allowable subject matter:

As per claim 2, the prior art of record, taken alone or in combination thereof, does not disclose or suggest in the claimed combination:

a step of setting in advance a polarization voltage generation constant (Kpol), which is a change in a polarization voltage with respect to the charge/discharge electricity amount in the usable domain, that is determined depending on the physical properties and the state of charging or discharging of the secondary battery, wherein the estimated charge/discharge electricity amount  $\Delta Q_e$  is calculated as a function of the change in the no-load voltage or the open circuit voltage  $\Delta V_b$  using an equation expressed as:

$$\Delta Q_e = K_b \times (\Delta V_b + \Delta V_{bc}) / (K_{eq} + K_{pol})$$

As per claim 13, the prior art of record, taken alone or in combination thereof, does not disclose or suggest in the claimed combination:

a polarization voltage generation constant setting part that sets in advance a polarization voltage generation constant ( $K_{pol}$ ), which is a change in a polarization voltage with respect to the charge/discharge electricity amount in the usable domain of, that is determined depending on the physical properties and the state of charging or discharging of the secondary battery,

wherein the estimated charge/discharge electricity amount calculation part calculates the estimated charge/discharge electricity amount  $\Delta Q_e$  as a function of the change in the no-load voltage or the open circuit voltage  $\Delta V_b$  using an equation expressed as:

$$\Delta Q_e = K_{bx} (\Delta V_b + \Delta V_{bc}) / (K_{eq} + K_{pol})$$

### ***Conclusion***

8. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any

extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to RAMY RAMADAN whose telephone number is (571) 272-9761. The examiner can normally be reached on Mon-Fri 7:30 am-5:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Akm Ullah can be reached on (571) 272-2361. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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